

Bald Eagle Restoration on the California Channel Islands
January — December 2016
15th Annual Report



Restoring Natural Resources
harmed by DDTs and PCBs

Bald Eagle Restoration on the California Channel Islands
January — December 2016
15th Annual Report

Prepared by:

Peter B. Sharpe
Institute for Wildlife Studies
Post Office Box 1104
Arcata, California 95518

Prepared for:

National Park Service
And
Montrose Settlements Restoration Program

February 2017

Recommended Citation:

Sharpe, P. B. 2017. Bald Eagle Restoration on the California Channel Islands, January - December 2016, 15th Annual Report. Unpublished report prepared by the Institute for Wildlife Studies, Arcata, California for the National Park Service and Montrose Settlements Restoration Program. 23 pp.

EXECUTIVE SUMMARY

The Institute for Wildlife Studies (IWS) began bald eagle (*Haliaeetus leucocephalus*) restoration efforts on Santa Catalina Island in 1980, nearly 20 years after bald eagles had disappeared from the Channel Islands due to human persecution and the introduction of DDT into the Southern California Bight. Unfortunately, residual DDT continued to impact the birds and the population was maintained by artificial incubation of the fragile eggs, fostering of chicks to active nests, and continued release of birds from hacking towers. In 2002, IWS initiated a 5-year bald eagle restoration feasibility study on Santa Cruz Island, in cooperation with the National Park Service, to determine whether the eagles could reproduce successfully if located farther from the primary DDT source off the Palos Verdes Peninsula. IWS released 61 eagles on Santa Cruz Island from 2002-2006. In 2006, the first known nesting attempts occurred on the northern Channel Islands and 2 pairs of eagles successfully fledged one chick each. The following year we began leaving eggs in some of the nests on Catalina and discontinued nest manipulations in 2009. Since 2006, we have banded 121 chicks that hatched naturally in nests on Santa Cruz, Santa Rosa, Anacapa, Santa Catalina, and San Clemente Islands.

In 2016, there were 17 known nesting attempts on the Channel Islands: 7 on Santa Catalina Island, 6 on Santa Cruz Island, 2 on Santa Rosa Island, 1 on Anacapa Island, and 1 on San Clemente Island. Overall nesting success was only 59% (10 of 17 attempts) and a minimum of 16 chicks are known to have hatched in 10 nests, all of which fledged (0.94 fledglings/nesting attempt). This productivity was higher than in 2015, but still below targets set by the U.S. Fish and Wildlife Service. Most failures occurred late in the incubation period or soon after hatching, and possible causes include effects of DDE or domoic acid poisoning.

Based upon the sightings of birds this year, we estimate that there are at least 44 bald eagles on the Channel Islands. These primarily are breeding adults and it is likely that there are additional juveniles/subadults present that have not been seen or identified. Thirteen additional eagles originally from the islands were reported on the mainland.

In 2017, we expect a similar number of active eagle nests, with some potential mate replacement. We will continue our annual bald eagle and peregrine falcon surveys on all 8 Channel Islands in 2017, and will concentrate additional survey efforts on portions of the coastlines where individual eagles have been seen in recent years, but where there are no known

territories, such as the southern coast of Santa Cruz and the eastern and western portions of Santa Rosa.

ACKNOWLEDGMENTS

We would like to thank the National Park Service (NPS), United States Navy (USN), The Nature Conservancy, and the Santa Catalina Island Conservancy for their cooperation and allowing us access to their property to conduct our surveys and monitoring. We thank the NPS and the USN for providing transportation to and from the islands. We thank Annie Little and Jennifer Boyce for assisting in project coordination. David Garcelon handled contract administration, permitting, and provided editorial comments on the final report. Finally, we appreciate the hard work and dedication of this season's field crew: Nate Melling, Logan Reese, Philip Kavouriaris, Anna Fasoli, Leslie Loveland, Jessica Rempel, Nicole Desnoyers, and Justyn Stahl. Jim Campbell-Spickler helped insure that the nest entries were made quickly and safely, for both the birds and personnel. Finally, we thank Tim Sears, Andrew Olson, and Will Olson of IP Video Specialists for their assistance in installing new camera systems at the Sauces, West End, and Two Harbors nests that are being provided by Explore.org for the 2017 breeding season.

TABLE OF CONTENTS

Executive Summary	i
Acknowledgments	ii
List of Tables	v
List of Figures	vi
Introduction	1
Study Area	2
Methods	3
Permitting	3
Surveying and Nest Monitoring	3
Marking and Sampling	4
Monitoring of Previously Released Eagles	4
Results	5
Surveying and Nest Monitoring	5
Santa Catalina Island	5
West End Territory	5
Pinnacle Rock Territory	6
Two Harbors Territory	7
Seal Rocks Territory	8
Rattlesnake Territory	8
Middle Ranch Territory	9
Empire Territory	9
San Clemente Island	9
Bald Canyon Territory	9
Santa Cruz Island	10
Sauces Territory	10
Pelican Harbor Territory	12
Cueva Valdez Territory	12
Malva Real Territory	13

Table of Contents. Continued.

Fry's Harbor Territory	13
Fraser Point Territory	13
Baby's Harbor Territory	13
Smuggler's Territory	14
Santa Rosa Island	14
Trap Canyon Territory	14
Lopez Canyon Territory	14
Anacapa Island	16
Oak Canyon Territory	16
Nesting Summary	16
Monitoring of Previously Released/Hatched Bald Eagles	17
Discussion	19
Recommendations	21
Literature Cited	21

LIST OF TABLES

1.	Biographical data for bald eagle chicks hatched at nests on the southern Channel Islands, CA, during 2016.	6
2.	Biographical data for bald eagle chicks hatched at nests on the northern Channel Islands, CA, during 2016.	12
3.	Summary of nesting attempts by bald eagles on the California Channel Islands in 2016.	17
4.	Status of bald eagles released or fledged from nests on the southern Channel Islands, CA, prior to 2016 that had confirmed sightings in 2016.	18
5.	Status of bald eagles released or fledged from nests on the northern Channel Islands, CA prior to 2016 that had confirmed sightings in 2016.	19

LIST OF FIGURES

1.	California Channel Islands located off the coast of southern California, USA.	1
2.	Bald eagle territories on Santa Catalina Island, CA, in 2016.	5
3.	The West End chicks at the time of banding in 2016.	6
4.	The Pinnacle Rocks chicks, with prey delivered by Male K-88, at the time of banding in 2016.	7
5.	The Seal Rocks chick prior to banding in 2016.	8
6.	The Rattlesnake chick after banding in 2016.	9
7.	Bald Canyon territory on San Clemente Island, CA, 2016.	10
8.	Bald eagle territories on Santa Cruz Island, CA, in 2016.	11
9.	The Sauces Canyon chicks after banding in 2016.	12
10.	The Baby's Harbor chicks following banding in 2016.	13
11.	The Smuggler's chick at the time of banding in 2016.	14
12.	Bald eagle territories on Santa Rosa Island, CA, in 2016.	15
13.	The Lopez Canyon bald eagle chick at the time of banding in 2016.	15
14.	The Oak Canyon bald eagle territory on Anacapa Island, CA, in 2016.	16

INTRODUCTION

Bald eagles (*Haliaeetus leucocephalus*) once bred on all 8 of the California Channel Islands, but the population was extirpated by the early 1960s (Kiff 1980), likely due to the introduction of the organochlorine pesticide DDT into the Southern California Bight. DDE (a DDT metabolite) levels have been found to be inversely correlated with eggshell thickness and productivity in bald eagles (Hickey and Anderson 1968, Wiemeyer et al. 1984). The Institute for Wildlife Studies (IWS) initiated reintroduction efforts on Santa Catalina Island, California (Catalina; Fig. 1) by releasing 33 young eagles from hacking towers between 1980 and 1986. Breeding attempts in 1987 and 1988 failed (Garcelon et al. 1989) and mean levels of DDE in egg remains recovered from nests were twice as high as that which has been shown to cause complete reproductive failure (Wiemeyer et al. 1984). Eggs also exhibited thinning of the shell (L. Kiff, Expert Report) and areas of gross structural abnormalities of the eggshell that resulted in rapid water loss and a weakening of the eggshell (Risebrough 1998).



Figure 1. California Channel Islands located off the coast of southern California, USA.

From 1989 through 2008, the reintroduced population on Catalina was maintained by placing artificial eggs in nests and removing the weakened eggs for artificial incubation. Sixty-six chicks were fostered into active nests and 21 additional birds were released from hacking towers. Foster

chicks were from mainland wild nests (4 chicks), produced by captive adults at the Avian Conservation Center (ACC) at the San Francisco Zoo (38 chicks) or hatched from eggs removed from the Catalina nests and artificially incubated (24 chicks).

IWS expanded bald eagle restoration to the northern Channel Islands beginning in 2002 with the release of 61 eagles from hacking towers on Santa Cruz Island (Santa Cruz) over a 5-year period. In 2006, two pairs on Santa Cruz successfully hatched and fledged one chick each (Sharpe 2007), the first known bald eagle chicks to hatch naturally in the wild on the California Channel Islands since 1950 (Miller 1950). As a result of increased hatching success during artificial incubation and natural breeding on Santa Cruz, we began leaving eggs in some Catalina nests in 2007 and discontinued egg removals altogether in 2009.

The number of breeding pairs on the Channel Islands is slowly increasing and we have documented territorial pairs and successful breeding on 5 of the 8 islands. As of 2016, there were 7 pairs on Catalina, 8 pairs on Santa Cruz, 2 pairs on Santa Rosa Island (Santa Rosa), 1 pair on Anacapa Island (Anacapa), and 1 pair on San Clemente Island (San Clemente). This report summarizes the results of our 2016 bald eagle surveying and monitoring efforts.

STUDY AREA

In 2016, we monitored bald eagles on Catalina, Santa Cruz, Santa Rosa, Anacapa, and San Clemente. Catalina, located 34 km south of Long Beach, California, is owned primarily by the Santa Catalina Island Conservancy (~88%). The 194 km² island is 34 km long, 0.8 to 13.0 km wide, and has an 80 km of coastline and maximum elevation of 648 m (Junak et al. 1995; Fig. 1).

The northern Channel Islands (NCI), which are composed of San Miguel, Santa Rosa, Santa Cruz, and Anacapa Islands, are located approximately 19 to 44 km off the coast of Ventura and Santa Barbara counties (Fig. 1). Santa Cruz is the largest of the eight Channel Islands, measuring about 38 km in length and 12 km wide at its widest point (Fig. 1). The island is approximately 249 km² with a maximum elevation of 753 m. Santa Cruz is the most rugged and topographically diverse of the northern Channel Islands and has a Mediterranean climate, with mean monthly temperatures ranging from 11.7 - 20.9° C and a mean annual rainfall of 50 cm (Junak et al. 1995). The National Park Service (NPS) owns and manages the eastern 24% of the island and The Nature Conservancy (TNC) owns the western 76% of the island.

Santa Rosa is the second largest of the Channel Islands and is owned by the NPS (Fig. 1). The island is approximately 24 x 16 km and encompasses about 217 km² with a central mountain range reaching an elevation of approximately 475 m (Junak et al. 1995, Rick 2009). The central highland is dissected by drainages; a relatively gentle marine terrace occurs north of the highland, whereas steep, deeply incised drainages comprise much of the south portion of the island (Coonan and Schwemm 2009).

Anacapa, which is composed of three islets (East, Middle, and West Anacapa; Fig. 1) is owned by the NPS. The island encompasses approximately 2.8 km², spanning about 8 km from end to end and reaching a maximum elevation of 283 m (Junak et al. 1995).

San Clemente, owned by the U.S. Navy, is the southernmost of the California Channel Islands, located approximately 92 km off the coast of California (Fig. 1). The island is 143 km², about 34 km long, and has a high point of 610 m (Willey 1997). It is characterized by a series of marine terraces on the west side and a steep escarpment on the east side (Kaiser et al. 2009).

METHODS

Permitting

IWS has the required Memorandum of Understanding and Scientific Collecting Permits (Permit #s SC-2485 [Peter Sharpe] and SC-0932 [David Garcelon]) with the California Department of Fish and Wildlife to conduct bald eagle research on the California Channel Islands, a banding permit from the United States Geological Survey's Bird Banding Laboratory (# 21564) allowing us to band bald eagles, and a research permit from the NPS (Permit # CHIS-2016-SCI-0012). Authorization for Migratory Bird Treaty Act (MBTA) permits were delayed, so IWS was added to the Region 8 FWS MBTA permit (Permit# MB164274-0) to allow collection of feathers, failed eggs, and eggshells at nests.

Surveying and Nest Monitoring

Observations of adult eagles began in January or February at each of the known territories. In conjunction with surveys for peregrine falcons (*Falco peregrinus*), we conducted weekly or bi-weekly ground surveys of Catalina, Santa Cruz, and Santa Rosa to locate new bald eagle nesting

pairs. We used GPS units to record our survey routes and plotted the data using Garmin Basecamp™, which allowed us to share data among our biologists and evaluate areas that needed additional surveys. Once we confirmed nesting eagles, we found partially hidden locations from which to monitor the chronology and outcome of nesting attempts. We had established video cameras prior to the nesting season at 3 active nests on Catalina (West End, Two Harbors, and Seal Rocks) and 2 nests on Santa Cruz (Sauces and Fraser Point), which enabled close, remote observations of nesting activity. The West End, Two Harbors, Sauces, and Fraser Point nests were available for live viewing on our website (www.iws.org). The Sauces cam was also streamed via Explore.org.

Marking and Sampling

We entered each nest when the eagle chicks were approximately 6-8 weeks old to equip them with federal leg bands, orange Acraft bands (Acraft Sign & Nameplate Co., Edmonton, AB, Canada) and patagial wing markers (orange on Catalina, light blue on NCI). We also collected a blood sample (~10 cc) for future contaminant analyses, and made morphological measurements to determine sex (Bortolotti 1984, Garcelon et al. 1985). For birds that had measurements that could be large males or small females, sex was confirmed later with a blood sample sent for DNA analyses (Avian Biotech International, Tallahassee, FL).

Monitoring of Previously Released Eagles

We closely monitored the status of the few eagles from previous years that are still carrying GPS-PTTs (Microwave Telemetry Inc., Columbia, Maryland). During monitoring and other field work we searched for other eagles that were no longer carrying functioning transmitters. We entered sighting information from observers on the islands and the mainland using Microsoft Access (Microsoft Corporation, Redmond, WA) database software.

RESULTS

Surveying and Nest Monitoring

Santa Catalina Island

Nests were located during February and March in 7 previously active territories on Catalina (Pinnacle Rock, Seal Rocks, West End, Two Harbors, Rattlesnake, Middle Ranch, Empire; Fig. 2) and we did not locate any new territorial pairs.

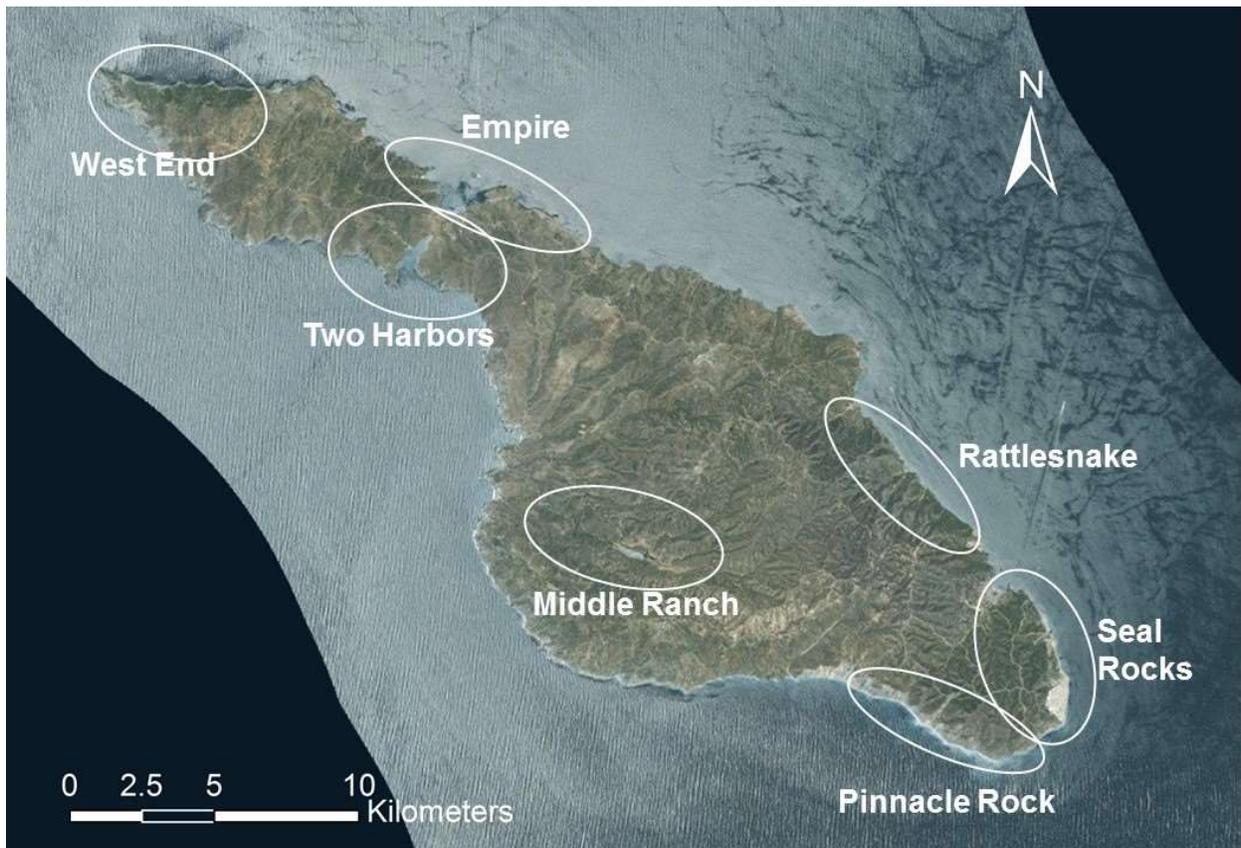


Figure 2. Bald eagle territories on Santa Catalina Island, CA in 2016.

West End Territory. The West End pair (Fig. 2) used the same nest that has been in use in the territory since 1991. The female was K-91, a 2009 Two Harbors chick, and the male was K-01, a bird produced at the ACC and fostered into the Pinnacle Rock nest in 2000. K-91 laid her first egg on 11 February and a second egg on 15 February, which hatched on 21 March and 23 March, respectively. We entered the nest on 10 May to equip the birds with leg bands and patagial wing markers and to collect blood samples for contaminant analyses (Fig. 3, Table 1). Eagle K-62

fledged on 28 June and Eagle K-60 fledged on 24 June.

During the first half of December, we upgraded the video system at the West End nest with equipment provided by Explore.org, including a 1080p pan/tilt/zoom camera inside a self-cleaning enclosure, which will allow us to clean salt spray from the camera dome, which has hindered viewing in past years. Video streams will be hosted by Explore.org during the 2017 season.



Figure 3. The West End chicks at the time of banding in 2016.

Table 1. Biographical data for bald eagle chicks hatched at nests on the southern Channel Islands, CA, during 2016.

Federal Band	Acraft Band	Sex	Wing Tag	Date Fledged	Territory	Status ^c
709-03091	60/A	M	K-60	6/24/16	West End ^a	Unknown
709-03092	64/A	F	K-62	6/28/16	West End ^a	Unknown
709-03093	66/A	F	K-64	~6/24/16	Seal Rocks ^a	Unknown
709-03094	67/A	F	K-66	~7/2/16	Pinnacle Rock ^a	Unknown
709-03095	68/A	M	K-68	~7/2/16	Pinnacle Rock ^a	Unknown
709-03096	69/A	M	K-69	~6/24/16	Rattlesnake ^a	Unknown
Chick 1	NA	.	NA	~7/4/16	Bald Canyon ^b	Unknown
Chick 2	NA	.	NA	~7/4/16	Bald Canyon ^b	Unknown

^a Catalina

^b San Clemente

^c As of 12/31/16

Pinnacle Rock Territory. The Pinnacle Rock pair (Fig. 2) used the same nest as in 2015. The female has no wing markers, but we were able to confirm that she has a USGS leg band on her left leg, which is an indication that she is from the islands. The male was K-88, who hatched at the Twin Rocks nest in 2008 and was the breeding male in the Middle Ranch nest in 2014. We

observed the first egg on 23 February and a confirmed a second egg on 9 March. There were 2 chicks in the nest on 4 April.

We entered the nest on 19 May and equipped both chicks with leg bands and patagial wing markers and collected blood samples for contaminant analyses (Fig. 4, Table 1). Both chicks had fledged by 2 July.



Figure 4. The Pinnacle Rocks chicks, with prey delivered by Male K-88, at the time of banding in 2016.

Two Harbors Territory. The Two Harbors pair (Fig. 2) used the same nest that they have used since 2003. The male, K-81, is an ACC-produced eagle that was fostered into the West End nest in 1998. The female, K-82, hatched from an egg removed from the West End nest in 1998 and was fostered into the Pinnacle Rock nest. The nest was monitored primarily via our live web cam. The first egg was laid on 25 February and the second egg on 29 February. One of the eggs disappeared during incubation and the second egg failed to hatch. The egg was expected to hatch by 4 April and we entered the nest on 15 April to remove the egg for contaminants analyses. We opened the egg to put the contents in a chemically-cleaned jar and there was no evidence of chick development.

During the first half of December, we upgraded the video system at the Two Harbors nest with equipment provided by Explore.org, including a 1080p pan/tilt/zoom camera inside a self-cleaning enclosure. Video streams will be hosted by Explore.org during the 2017 season.

Seal Rocks Territory. The Seal Rocks pair (Fig. 2) used the same nest as in 2015. The female, K-34, is from the captive ACC eagles and was hacked at the Bulrush tower in 1993. The male, K-25, hatched from an egg from the West End territory and was fostered into the Pinnacle Rock nest in 1992. The birds were found incubating on 9 February. We could never confirm more than 1 egg and a single chick was present on 21 March.



Figure 5. The Seal Rocks chick prior to banding in 2016.

We entered the nest on 11 May to equip the bird with leg bands and patagial wing markers and to collect a blood sample for contaminant analyses (Fig. 5, Table 1). We continued to monitor the bird until it fledged around 24 June.

Rattlesnake Territory. The Rattlesnake pair (Fig. 2) used the same nest that they used in 2015. The male, K-80, was produced by eagles at the ACC in 1998 and was fostered into the West End nest. The female has lost both wing markers, but we believe she is still K-47, who was produced by eagles at the ACC in 2004 and was fostered into the Seal Rocks nest. We confirmed the birds were incubating at least 1 egg on 25 February. We saw 1 chick in the nest on 5 April.

We entered the nest on 20 May to equip the chick with leg bands and patagial wing markers and to collect a blood sample for contaminant analyses (Fig. 6, Table 1). We monitored the nest until the chick fledged around 24 June.

Middle Ranch Territory. The Middle Ranch (Fig. 2) female has lost both her wing markers, but we believe she is A-37, who was produced by eagles at the ACC in 2005 and hacked from the South Tower on Santa Cruz. The male was K-00, hatched at the Pinnacle Rock nest in 2007, and formerly the breeding male at the Twin Rocks nest. The birds were incubating by 24 February, but had failed by 2



Figure 6. The Rattlesnake chick after banding in 2016.

March. There was further courtship behavior, including work on the nest, but there were no further nesting attempts.

Empire Territory. The Empire pair (Fig. 2) used the same nest as in 2015. The male has lost both wing markers, but we believe he is K-51, who was produced by eagles at the ACC in 2005 and fostered at the Pinnacle Rock nest. The female, K-03, hatched at the Seal Rocks nest in 2007. The birds were incubating 2 eggs on 4 March. The pair incubated until at least 6 April, but the nest had failed by 14 April. Throughout the season, the female appeared to still have a leg injury (noticed in 2015) that made it difficult to lie down or stand up from incubating, which may have resulted in improper incubation of the eggs. There were no further nesting attempts.

San Clemente Island

We surveyed for and monitored eagles on San Clemente Island in conjunction with other research on the island and located 1 active nest in the historic Bald Canyon territory (Fig. 7).

Bald Canyon Territory. We placed a camera on the Bald Canyon nest (Fig. 7) in the fall of 2015 for remote monitoring because the Navy restricts access to the nesting area throughout most of the year. We were unable to verify the identity of the adults this season, but we believe the male is K-76, hatched at the Twin Rocks nest in 2007 (the first naturally hatched Catalina bird to begin breeding). The female, believed to be A-32, was collected from a nest near Juneau,

AK in 2004 and released from the North hawk tower on Santa Cruz. The birds were found incubating 2 eggs on 9 March, which hatched on 9 April and 11 April.

We were unable to band the chicks because of restricted access to the nesting area through much of the chick-rearing season and thick fog that did not allow planes to land during the one window of time we had for banding. Both birds had fledged by 4 July.



Figure 7. Bald Canyon territory on San Clemente Island, CA, 2016.

Santa Cruz Island

We surveyed the 8 known breeding territories on Santa Cruz and located active nests in 6 territories (Sauces Canyon, Smuggler's, Pelican Harbor, Cueva Valdez, Fry's Harbor, Baby's Harbor; Fig. 8). We surveyed much of the island for new territories in conjunction with peregrine falcon surveys, but located no new territories.

Sauces Canyon Territory. The Sauces Canyon pair (Fig. 8) used the same nest as in 2015. Male A-40, a bird from the ACC, was hatched on Santa Cruz in 2005. The female, A-48, an

ACC-produced bird, was hacked on Santa Cruz in 2006. The first egg was laid on 1 February, but it broke on the morning of 4 February. A second egg was laid in the afternoon of 4 February and a third egg was laid on 7 February. The first chick hatched on 23 March and the second chick hatched on 14 March.

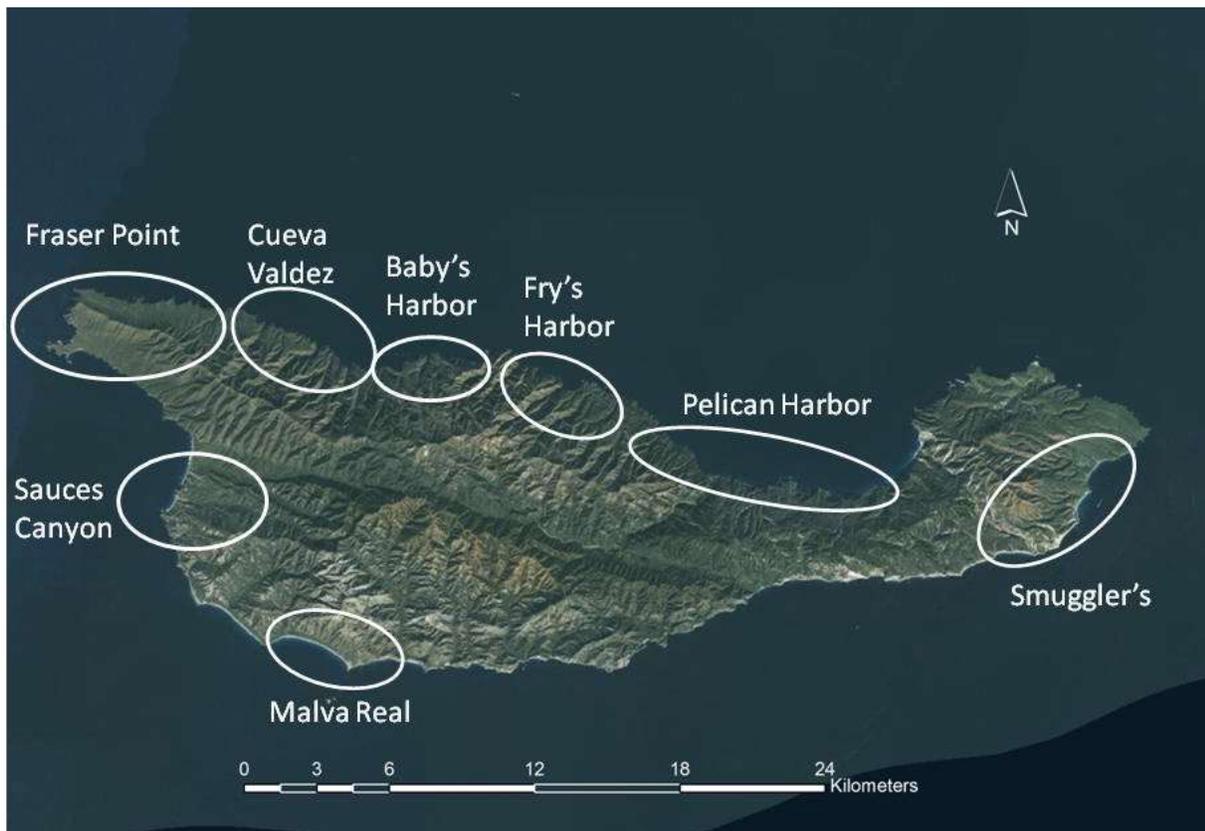


Figure 8. Bald eagle territories on Santa Cruz Island, CA, in 2016.

We entered the nest on 30 April to install leg bands and patagial wing markers on the eaglets, and to obtain blood samples for contaminants analyses (Fig. 9, Table 2). Both chicks fledged on 30 May. A-63 was seen on 30 August near Bayside, CA and on 9 November at the Finley National Wildlife Refuge in Oregon.

During the first week of December, we replaced the video system at the Saucers nest, as well as the relay sites at Mt. Diablo and the Navy Site, with equipment provided by Explore.org. We raised the height of the camera about 1 m so that we should be able to view the eggs during the 2017 nesting season. The new system includes a 1080p pan/tilt/zoom camera that will provide sharper, closer views of the eggs, chicks, and activity at the nest.

Pelican Harbor Territory. The Pelican Harbor pair (Fig. 8) used the same nest as in 2014. The male was K-10, produced by the ACC and fostered into the Twin Rocks nest on Catalina in 2001. We could not verify the identity of the female, but believe she is still K-26, produced by the ACC and fostered into the West End nest on Catalina Island in 2002. The pair was found incubating at least 1 egg on 29 February. They incubated until at least 20 March, but appeared to have failed by 30 March. There were no further nesting attempts observed.



Figure 9. The Sauces Canyon chicks after banding in 2016.

Table 2. Biographical data for bald eagle chicks hatched at nests on the northern Channel Islands, CA, during 2016.

Federal Band	Acraft Band	Sex	Wing Tag	Date Fledged	Territory	Status ^c
709-03085	61/A	M	A-61	~6/25/16	Smuggler's ^a	Alive, S. of Corvallis, OR 12/24/16
709-03086	62/A	M	A-62	5/30/16	Sauces ^a	Unknown
709-03087	63/A	M	A-63	5/30/16	Sauces ^a	Alive in OR, 11/9/16
709-03088	65/A	F	A-65	~6/13/16	Lopez Canyon ^b	Unknown
709-03089	00/A	F	NA	~6/22/16	Trap Canyon ^b	Unknown
709-03090	06/A	M	NA	~6/22/16	Trap Canyon ^b	Unknown
709-03097	16/A	F	A-99	~6/23/16	Baby's Harbor ^a	Alive, Burton, BC 9/18/16
709-03098	37/A	M	A-66	~6/23/16	Baby's Harbor ^a	Alive, Livermore, CA 9/13/16

^a Santa Cruz

^b Santa Rosa

^c As of 12/31/16 or date specified

Cueva Valdez Territory. The Cueva Valdez pair (Fig. 8) used the same nest as in 2015. The male, A-00, was produced by the ACC and hatched on Santa Cruz in 2002. The previous female, A-16, has been replaced by A-74, a bird hatched at the Pelican Harbor nest in 2011. We found the adults incubating eggs on 31 March, but the nest had failed by 18 April. There were no further breeding attempts.

Malva Real Territory. The Malva Real pair (Fig. 8) were seen throughout the season, but there was no evidence that they nested. We were unable to confirm the identity of either bird.

Fry's Harbor Territory. The Fry's Harbor pair (Fig. 8) used a nest up the canyon from Fry's Harbor. The male is A-46, a 2006 ACC-produced male, but we were unable to identify the new female that replaced the deceased A-24 in 2015. The birds were observed incubating on 4 March through 16 April and are believed to have had small nestling(s) on 18 April. The nest failed by 2 May and there were no further breeding attempts.

Fraser Point Territory. The Fraser Point pair (Fig. 8) attempted to use the same nest as in 2015, but a golden eagle (*Aquila chrysaetos*) that was present in the territory throughout the breeding season disrupted any breeding attempts. Female A-49, who hatched at the Pelican Harbor nest in 2006, was present in the territory throughout the season, but male, A-64 (hatched at the Pelican Harbor nest in 2008) was seen at the nest only once, on 26 February.

Baby's Harbor Territory. The Baby's Harbor pair (Fig. 8) used the same nest as in 2015. The male was A-68, a bird hatched at the Pelican Harbor nest in 2010. The female was A-27, a bird removed from a nest near Juneau, AK in 2004 and released from the South hack tower on Santa Cruz. We found the birds incubating on 19 March and there were two chicks present on 16 April.

We entered the nest on 27 May to equip the chicks with leg bands and patagial wing markers and to obtain blood samples for contaminant analyses (Table 2, Fig. 10). We continued to monitor the chicks until they fledged around 23 June. A-99 was seen near Burton, B.C. on 8 September, and A-66 was seen near Livermore, CA on 13 September.



Figure 10. The Baby's Harbor chicks following banding in 2016.

Smuggler's Territory. The Smuggler's pair (Fig. 8) used the same nest as in 2015. We were unable to confirm the identity of the male, but the female was A-51, a bird produced at the ACC and released on Santa Cruz in 2006.

The pair was confirmed to be incubating on 1 March and there was a nestling present on 19 March.

We entered the nest on 29 April to equip the chick with leg bands and patagial wing markers and to obtain a blood sample for contaminants analyses (Table 2, Fig. 11). The chick had fledged by 25 June and was seen at the Finley National Wildlife Refuge in Oregon on 24 December.



Figure 11. The Smuggler's chick at the time of banding in 2016.

Santa Rosa Island

We located active nests in the 2 known territories on the island, Trap Canyon and Lopez Canyon (Fig. 12), and surveyed most of the coastline for new territories.

Trap Canyon Territory. The Trap Canyon pair (Fig. 12) used the same nest as in 2015. We could not confirm the identity of the male, but we believe he is still A-08, an Alaskan bird hacked on Santa Cruz in 2002. The female was A-22, a bird produced by the ACC and hacked on Santa Cruz in 2004. The birds were incubating on 17 February and there were 2 nestlings present on 30 March.

We entered the nest on 2 May to equip the chicks with leg bands and to draw blood for contaminant analyses (Table 2). The chicks were too young (~ 6 weeks old) to attach patagial wing markers. One chick fledged around 9 June and the remaining chick fledged by 22 June.

Lopez Canyon Territory. The Lopez Canyon pair (Fig. 12) used the same nest in a large toyon (*Heteromeles arbutifolia*) as in previous years. The male was A-69, a 2010 Pelican Harbor chick. We were not able to verify the female's identity, but we believe she was A-43, a bird produced

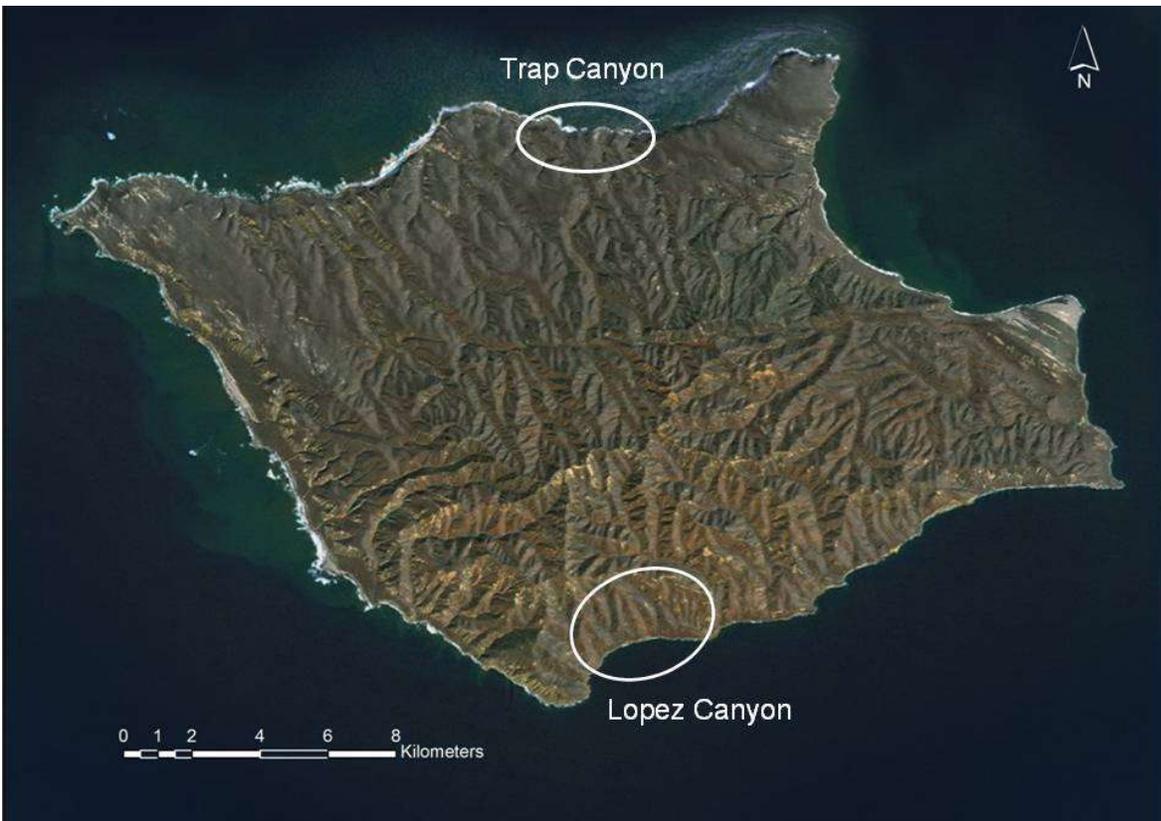


Figure 12. Bald eagle territories on Santa Rosa Island, CA, in 2016.

by the ACC and hacked on Santa Cruz in 2005. The birds were observed incubating on 16 February and a chick was observed on 16 March.

We entered the nest on 2 May to attach leg bands and patagial wing markers, and to draw blood for contaminant analyses (Fig. 13, Table 2). We continued monitoring until the chick had fledged around 13 June.



Figure 13. The Lopez Canyon bald eagle chick at the time of banding in 2016.

Anacapa Island

We surveyed Anacapa aboard the vessel *Retriever*. We found a nesting pair in the previously known Oak Canyon territory (Fig. 14).

Oak Canyon Territory. The pair on West Anacapa Island used the same nest as in 2015 (Fig. 14). The male was A-21, which was collected from Alaska in 2003 and released from a hack



Figure 14. The Oak Canyon bald eagle territory on Anacapa Island, CA, in 2016.

tower on Santa Cruz. We could not confirm the identity of the female, but we believe she was A-11, which was removed from a nest near Juneau, AK in 2002 and released from a hack tower on Santa Cruz. The birds were incubating on 8 April, but the nest appeared to have failed by our next survey on 4 May and no eagles were seen on 1 June or 15 July.

Nesting Summary

Based upon our observations, there were 19 pairs of bald eagles across all the Channel Islands this season, of which 17 pairs laid a total of 26-33 eggs. Sixteen to 17 eggs hatched (48-62%) hatched and 16 of the chicks (94-100%) fledged (Table 3). Nesting success was 59% and productivity was 0.94 chicks/breeding attempt. Only 2 birds are known to have survived through

the end of the year (A-61 from Smuggler’s and A-63 from Sauces), but we rely on sighting reports for survival information, so it is likely that more birds survived.

Table 3. Summary of nesting attempts by bald eagles on the California Channel Islands in 2016.

Island/Nest	Eggs Laid	Chicks		Number Surviving Until End of Year
		Hatched	Fledged	
Santa Catalina Island				
West End	2	2	2	0-2
Pinnacle Rock	2	2	2	0-2
Seal Rocks	1	1	1	0-1
Two Harbors	2	0	.	.
Middle Ranch	1	0	.	.
Rattlesnake	1-2	1	1	0-1
Empire	2	0	.	.
TOTAL	11-12	6	6	0-6
San Clemente Island				
Bald Canyon	2	2	2	0-2
TOTAL	2	2	2	0-2
Santa Cruz Island				
Baby’s Harbor	2	2	2	0-2
Sauces	3	2	2	1-2
Cueva Valdez	1-2	0	.	.
Fry’s Harbor	1-2	0-1	0	.
Malva Real	0	.	.	.
Fraser Point	0	.	.	.
Smuggler’s	1-2	1	1	1
Pelican Harbor	1-2	0	.	.
TOTAL	9-13	5-6	5	2-5
Santa Rosa Island				
Trap Canyon	2	2	2	0-2
Lopez Canyon	1-2	1	1	0-1
TOTAL	3-4	3	3	0-3
Anacapa Island				
Oak Canyon	1-2	0	.	.
TOTAL	1-2	0	0	0
All Islands Combined	26-33	16-17	16	2-16

Monitoring of Previously Released/Hatched Bald Eagles

We continued to monitor eagles that had been released or hatched naturally on the Channel Islands prior to 2016. Twenty-three bald eagles that were released or hatched on the

southern Channel Islands in previous years were seen during 2016 (Table 4). Fourteen of the birds were on Catalina, 1 on Santa Cruz, and 8 on the mainland. We had no confirmed mortalities among the eagles from the southern Channel Islands this year.

Table 4. Status of bald eagles released or fledged from nests on the southern Channel Islands, CA, prior to 2016 that had confirmed sightings in 2016.

FWS Leg Band	Sex ^a	Patagial Marker	Nest/Release Tower	Fledge Year	Status, Latest Location ^b
629-19925	M	K-25	Pinnacle Rock	1992	Alive, Seal Rocks pair, Catalina Is.
629-19928	F	K-34	Bulrush Tower	1993	Alive, Seal Rocks pair, Catalina Is.
629-39815	M	K-80	West End	1998	Alive, Rattlesnake pair, Catalina Is.
629-39816	M	K-81	West End	1998	Alive, Two Harbors pair, Catalina Is.
629-39817	F	K-82	Pinnacle Rock	1998	Alive, Two Harbors pair, Catalina Is.
629-29498	M	K-01	Pinnacle Rock	2000	Alive, West End pair, Catalina Is.
629-02780	M	K-10	Twin Rocks	2001	Alive, Pelican Harbor pair, Santa Cruz Is.
629-47371	F	K-47	Seal Rocks	2004	Alive, Rattlesnake pair, Catalina Is.
629-52425	M	K-00	Pinnacle Rock	2007	Alive, Middle Ranch pair, Catalina Is.
629-52434	F	K-03	Seal Rocks	2007	Alive, Empire pair, Catalina Is.
629-52442	F	K-83	Two Harbors	2008	Alive, Big Bear, CA 8/30/16
629-52443	M	K-88	Twin Rocks	2008	Alive, Pinnacle Rock pair, Catalina Is.
629-52450	F	K-91	Two Harbors	2009	Alive, West End pair, Catalina Is.
679-03429	F	K-97	West End	2009	Alive, Breeding at Lake Casitas, CA
679-04102	F	K-07	Seal Rocks	2011	Alive, San Jacinto Wildlife Area, CA 2/5/16
679-04103	M	K-08	Seal Rocks	2011	Alive, Catalina Is. 9/29/16
679-04105	M	K-19	Rattlesnake	2011	Alive, Lake Wohlford, CA 3/23/16
679-04136	M	K-27	West End	2013	Alive, Brachendale Eagles Park, BC 11/13/16
679-04137	F	K-28	West End	2013	Alive, Catalina Island, 3/17/16
709-03058	M	K-41	Seal Rocks	2014	Alive, Big Bear Lake, CA 7/2/16
709-03066	F	K-46	Rattlesnake	2014	Alive, on Catalina Is. throughout 2016
709-03076	F	K-55	Seal Rocks	2015	Alive, Big Bear Lake, CA 12/13/16
709-03082	M	NA	Bald Canyon	2015	Alive, Moclips, WA 8/5/16 (leg band 5/D)

^a Determined by karyotyping and/or morphometrics.

^b As of 12/31/16 unless otherwise noted.

Twenty-two eagles that were released on Santa Cruz, or hatched naturally on the northern Channel Islands in previous years, were seen in 2016 (Table 5). Ten of the birds were on Santa Cruz, 5 on Santa Rosa, 1 on Anacapa, and 6 on the mainland. Although 2 eagles were carrying functioning GPS-PTTs at the beginning of the year, there were no active PTTs as of 31 December.

Table 5. Status of bald eagles released or fledged from nests on the northern Channel Islands, CA prior to 2016 that had confirmed sightings in 2016.

FWS	Sex ^a	Patagial	Source ^b	Fledge	Status, Latest Location ^c
Leg Band		Marker		Year	
629-02795	M	A-00	Zoo	2002	Alive, Cueva Valdez pair, Santa Cruz Is.
629-47360	F	A-17	Alaska	2003	Alive, Santa Rosa Is.
629-47356	M	A-21	Alaska	2003	Alive, Oak Canyon pair, Anacapa Is.
629-47365	F	A-22	Zoo	2004	Alive, Trap Canyon pair, Santa Rosa Is.
629-47366	F	A-23	Zoo	2004	Alive, rehabbed and released in C. CA
629-47375	F	A-27	Alaska	2004	Alive, Baby's Harbor pair, Santa Cruz Is.
629-47391	M	A-40	Zoo	2005	Alive, Sauces pair, Santa Cruz Is.
629-52404	M	A-46	Zoo	2006	Alive, Fry's Harbor pair, Santa Cruz Is.
629-52406	F	A-48	Zoo	2006	Alive, Sauces pair, Santa Cruz Is.
629-52407	F	A-49	Pelican Harbor	2006	Alive, Fraser Point pair, Santa Cruz Is.
629-52410	F	A-51	Zoo	2006	Alive, Smuggler's pair, Santa Cruz Is.
629-52422	M	A-60	Malva Real	2006	Alive, Santa Rosa Is.
629-52438	M	A-64	Pelican Harbor	2008	Alive, Fraser Point pair, Santa Cruz Is.
679-03432	M	A-67	Trap Canyon	2010	Alive, Buena Park, CA 2/20/16
679-03435	M	A-68	Pelican Harbor	2010	Alive, Baby's Harbor pair, Santa Cruz Is.
679-03436	M	A-69	Pelican Harbor	2010	Alive, Lopez Canyon pair, Santa Rosa Is.
679-03444	M	A-72	Cueva Valdez	2010	Alive, Marin County, CA 11/4/16
679-04110	F	A-74	Pelican Harbor	2011	Alive, Cueva Valdez pair, Santa Cruz Is.
679-04128	F	A-85	Lopez Canyon	2013	Alive, Ramona Grasslands, CA 2/10/16
679-04130	M	A-87	Los Pinos	2013	Alive, Santa Rosa Is. 3/8/16
709-03052	M	A-94	Lopez Canyon	2014	Alive, San Jacinto, CA 12/21/16
709-03080	M	A-50	Lopez Canyon	2015	Alive, East Fork Lewis River, WA

^a Determined by karyotyping and/or morphometrics.

^b San Francisco Zoo (Zoo), wild nests near Juneau, Alaska (Alaska), or nests on Santa Cruz (Pelican Harbor, Cueva Valdez, Malva Real, Los Pinos) or Santa Rosa (Lopez Canyon, Trap Canyon).

^c As of 12/31/16, unless otherwise noted.

DISCUSSION

Productivity has varied greatly on the Channel Islands since 2009 when we discontinued manipulating Catalina nests, ranging from a high of 85% nest success and 1.15 fledglings/attempt in 2010 to a low of 47% nest success and 0.71 fledglings/attempt in 2015. This season's nest success and productivity increased slightly from that in 2015 to 59% and 0.94/fledglings per attempt, respectively, but remains below the Pacific Region Bald Eagle Recovery Plan's target of 65% nesting success and productivity of 1.0 fledgling/attempt (U.S. Fish and Wildlife Service

1986) for a second straight year. Since 2009, the mean success and productivity across all the islands has been 63% and 0.95 fledglings/attempt, respectively.

Most nesting failures this season appear to have occurred during the late incubation period, but it is possible that chicks hatched and died between nest checks. In 2009, the Pelican Harbor pair hatched 2 chicks, each of which died within 3 days (Sharpe 2010). If, in fact, chicks are hatching and dying, then one possible cause of mortality of young chicks could be domoic acid (DA) poisoning. DA poisoning has been associated with mortalities of brown pelicans (*Pelecanus occidentalis*), Brandt's cormorants (*Phalacrocorax penicillatus*), and California sea lions (*Zalophus californianus*) (Work et al. 1993, Sierra Beltran et al. 1997, Lefebvre et al. 1999). DA events have become more frequent and of increased magnitude since 2000-2001 in the Santa Barbara Channel and often occur during the chick-hatching period of April-May (Sekula-Wood et al. 2011). In addition, both DDT and DA cause neuroexcitation and could cause an additive or synergistic effect, which could be an important factor on the northern Channel Islands that are located at the crossroads of harmful algal blooms and a residual DDTs from the Montrose Chemical Corporation off the Palos Verdes Peninsula (Ramsdell 2010). This season, it appeared that a chick was hatching or had recently hatched at the Fry's Harbor nest based upon adult behavior, but the nest had failed 2 weeks later. Although there is no evidence of DA poisoning in the adult eagles, newly hatched chicks could be more susceptible because of their small size. In 2017, we will attempt monitor nests more frequently around expected hatch dates so that we can access failed nests to collect failed egg remains and/or dead chicks for potential contaminant and DA analyses.

In 2017, we expect a similar number of active eagle nests, with some potential mate replacement. The Empire pair on Catalina have been unsuccessful at hatching a chick since they began nesting in 2014, so it is likely the pair will separate in the near future. On Santa Cruz, the Malva Real pair should nest again after skipping this year and there is the potential for a new pair along the southern coast between the Malva Real and Smuggler's territories where we occasionally see adult eagles. On Santa Rosa, there is the potential for male A-60 to begin breeding with A-17, who have spent recent winters and springs in the vicinity of each other before A-17 makes an annual trip to central California.

RECOMMENDATIONS

We saw several near adult or adult eagles in 2016 that did not appear to be part of mated pairs. In addition to monitoring known pairs, we suggest continued surveys for new pairs in 2017, especially on the western and eastern quarters of Santa Rosa, the south-central coast of Santa Cruz, and the northeastern coast of San Clemente. We have been unable to access West Anacapa for a couple seasons to determine the outcome of nesting. If seabird breeding activity does not allow access to West Anacapa for banding in 2017, we would like to visit the island as soon as it is accessible to try to determine whether older chicks or young fledgings are present.

We recommend attempting to access nests that fail near expected hatch dates to determine whether chicks hatched and died or whether eggs failed to hatch to try to address whether domoic acid could be impacting breeding success.

LITERATURE CITED

- Bortolotti, G.R. 1984. Sexual size dimorphism and age-related size variation in bald eagles. *J. Wildl. Manage.* 48:72-81.
- Coonan, T.J., and C.A. Schwemm. 2009. Factors contributing to success of island fox reintroductions on San Miguel and Santa Rosa Islands, California. Pages 363–376 *in* Damiani, C.C. and D.K. Garcelon (eds.). *Proceedings of the 7th California Islands Symposium*. Institute for Wildlife Studies, Arcata, CA.
- Garcelon, D.K., M.S. Martell, P.T. Redig, and L.C. Buoen. 1985. Morphometric, karyotypic, and laparoscopic techniques for determining sex in bald eagles. *J. Wildl. Manage.* 49:595-599.
- Garcelon, D.K., R.W. Risebrough, W.M. Jarman, A.B. Chartrand, and E.E. Littrell. 1989. Accumulation of DDE by bald eagles *Haliaeetus leucocephalus* reintroduced to Santa Catalina Island in Southern California. Pages 491-494 *in* B.-U. Meyburg & R. Chancellor, eds. *Raptors in the modern world*. World Working Group on Birds of Prey and Owls, Berlin, London & Paris.
- Hickey, J. J., and D. W. Anderson. 1968. Chlorinated hydrocarbons and eggshell changes in raptorial and fish-eating birds. *Science* 162:271-273.

- Junak, S. T. Ayers, R. Scott, D. Wilken, and D. Young. 1995. A flora of Santa Cruz Island. Santa Barbara Botanic Garden, Santa Barbara, California. 397 pp.
- Kaiser, S.A, E.L. Kershner, and D.K. Garcelon. 1999. The influence of nest substrate and nest site Characteristics on the risk of San Clemente sage sparrow nest failure. Pages 301–313 *in* Damiani, C.C. and D.K. Garcelon (eds.). Proceedings of the 7th California Islands Symposium. Institute for Wildlife Studies, Arcata, CA.
- Kiff, L.F. 1980. Historical changes in resident populations of California Islands raptors. pp. 671-673 *in* Power, D.M. (ed.). The California Islands: proceedings of a multidisciplinary symposium Santa Barbara, California, Santa Barbara Museum of Natural History.
- Lefebvre, K. A., C. L. Powell, M. Busman, G. J. Doucette, P. D. R. Moeller, J. B. Silver, P. E. Miller, M. P. Hughes, S. Singaram, M. W. Silver, and R. S. Tjeerdema. 1999. Detection of domoic acid in northern anchovies and California sea lions associated with an unusual mortality event. *Nat. Toxins* 7: 85-92.
- Miller, A. 1950. Unpublished field notes, Channel Islands, March 5-14. MS on file at Museum of Vertebrate Zoology, University of California, Berkeley.
- Ramsdell, J. S. 2010. Neurological disease rises from ocean to bring model for human epilepsy to life. *Toxins (Basel)* 2:1646-1675.
- Rick, T.C. 2009. 8000 years of human settlement and land use in Old Ranch Canyon, Santa Rosa Island, California. Pages 21-31 *in* C.C. Damiani and D.K. Garcelon (eds.). Proceedings of the 7th California Islands Symposium. Institute for Wildlife Studies, Arcata, CA.
- Risebrough, R. W. 1998. Endocrine disrupters and bald eagles: A response. *Endangered Species UPDATE* 15:47-50.
- Sekula-Wood E., C. Benitez-Nelson, S. Morton, C. Anderson, C. Burrell, and R. Thunell. 2011. *Pseudo-nitzschia* and domoic acid fluxes in Santa Barbara Basin (CA) from 1993 to 2008. *Harmful Algae* 10:567–575,
- Sharpe, P. B. 2007. Bald Eagle Restoration on the Northern Channel Islands, California, January - December 2006, 5th Annual Report. Unpublished report prepared by the Institute for Wildlife Studies, Arcata, California for National Park Service, Ventura, California. 50 pp.
- Sharpe, P. B. 2010. Bald Eagle Restoration on the California Channel Islands, January - December 2009, 8th Annual Report. Unpublished report prepared by the Institute for Wildlife Studies, Arcata, California for National Park Service, Ventura, California. 25 pp.

- Sierra Beltran, A., M. Palafox-Uribe, J. Grajales-Montiel, A. Cruz-Villacorta, and J. L. Ochoa. 1997. Sea bird mortality at Cabo San Lucas, Mexico: Evidence that toxic diatom blooms are spreading: *Toxicon* 35:447-453.
- U.S. Fish and Wildlife Service. 1986. Recovery Plan for the Pacific Bald Eagle. U.S. Fish and Wildlife Service, Portland, Oregon. 163 pp.
- Wiemeyer, S. N., T. G. Lamont, C. M. Bunck, C. R. Sindelar, F. J. Gramlich, J. D. Fraser, and M. A. Byrd. 1984. Organochlorine pesticide, polychlorobiphenyl, and mercury residues in bald eagle eggs, 1969-1979, and their relationships to shell thinning and reproduction. *Arch. Environ. Contam. Toxicol.* 13:529-549.
- Willey, D.W. 1997 Characteristics of nesting areas used by San Clemente Island sage sparrows. *The Condor* 99:217-219.
- Work, T. M., B. Barr, A. M Beale, L. Fritz, M. A. Quilliam, and J. L. Wright. 1993. Epidemiology of domoic acid poisoning in brown pelicans (*Pelecanus occidentalis*) and Brandt's cormorants (*Phalacrocorax penicillatus*) in California. *Journal of Zoo and Wildlife Medicine*, 1:54-62.